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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

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June 4, 1993

Ms. Donna Searcy
Secretary of Federal
Communications Commission
1919 M Street, NW
Washington, D.C. 20054

RE: Amendment of Rules For Automatic Vehicle Monitoring Systems - PR Docket No. 93-61

Dear Ms. Searcy:

Transmitted herewith on behalf of Mark IV IVHS Division are an original and nine copies of its comments regarding the Application for Freeze of North American Teletrac and Location Technologies, Inc. dated May 21, 1993 in the above-captioned proceeding.

In the event that there are any questions concerning this matter, please communicate with the undersigned.

Very truly yours,

George Y. Wheeler

George Y. Wheeler

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	)	PR Docket No. 93-61
	)	RM No. 8013

TO: The Commission

COMMENTS OF MARK IV IVHS DIVISION

Mark IV IVHS Division ("Mark IV"), herewith, by its attorneys, files its comments regarding the Application for Freeze of North American Teletrac and Location Technologies, Inc. ("Teletrac") dated May 21, 1993 in the above-captioned proceeding.

Mark IV is a manufacturer of wideband AVM devices which are widely used by highway, toll, turnpike, tunnel and bridge authorities in a variety of IVHS applications. Mark IV systems are licensed under the Commission's Part 90 rules for interim AVM operations to operate with a six MHz wideband carrier in the 904-912 MHz portion of the AVM band. The system employs vehicle mounted transponders which are Part 15 certificated wideband devices operating in the 912-918 MHz frequency.

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List A B C D E

As described in the attached descriptive materials filed with its application (FCC Form 574) for a new system in St. George and Perry, Utah, Mark IV's Part 90 licensed system is highly spectrum efficient. The system operates with reading speed of 500 Kbits/second (± 10%) to support the high data rates

With numerous state, regional and local government authorities either in the process of implementing or planning near term installation of IVHS systems, we strongly urge the Commission to deny the Teletrac request that the Commission freeze further awards of licenses and special temporary authorities for Mark IV's systems to operate in the 904-912 MHz and 918-926 MHz bands. This action will preserve opportunities for a genuinely competitive marketplace, promote the rapid implementation of advanced AVM systems, and permit development of new and innovative AVM services.

DISCUSSION

1. Teletrac Has Failed To Establish Any Technical Basis For Assuming That Spectrum Sharing Between Mark IV's Wideband Systems With Those Of Others In The 904-912 MHz and 918-926 MHz Bands Is Not Feasible.

Mark IV systems currently operate under Part 90 licensing on shared frequencies in the 904-912 MHz band on a non-interference basis with the wide variety of other mobile communication devices which are increasingly using this band. Mark IV systems have been stringently tested by independent consultants and FCC approved test facilities to confirm their non-interfering characteristics. Testing also included the evaluation of the effects of the Mark IV systems on cellular phones, mobile radios, pagers, and car radios when these were operated in close proximity to its

AVM antennas. In all of these tests, no harmful interference cases were found in which any Mark IV system either disrupted or impaired the operations of other devices or received interference from any of these devices which disrupted or impaired its own operations.

The concerns expressed by Teletrac regarding potential interference to its own AVM systems appear to relate in substantial part to interference received from "narrowband" AVM systems and the possibility of multiple co-channel pulse-ranging multilateration systems serving the same markets. Mark IV's system differs substantially from these technologies in reduced intensity of radiated emissions and extremely confined coverage design. Mark IV's wideband carrier, to its knowledge, has never caused harmful interference to any collocated wideband AVM "location" system. Nor on the basis of Mark IV's engineering research is there any reasonable likelihood such interference ever would be caused considering the unique design of the Mark IV system.

2. Teletrac's Suggestion That A Freeze Is Necessary To Prevent The Filing Of "Paper" Proposals For Wideband Co-Channel Systems Is Totally Unjustified As Far As Mark IV Is Concerned.

Mark IV systems have been licensed by the Commission during the past two years to meet the needs of public authorities in many areas. Most recently the Orlando/Orange County Expressway

Authority obtained licenses for Mark IV systems in the Orlando, Florida area. Authorized facilities either have been or are being timely constructed and operated to provide important IVHS/public transportation needs. These are clearly not the "paper systems" which Teletrac claims should never have been authorized.

3. The Uncertainties Created By The Commission's Notice Of Proposed Rulemaking Are Not An Appropriate Basis For Freezing Awards Of AVM Licenses For Mark IV Systems.

Teletrac has failed to demonstrate how the processing of applications specifying Mark IV technologies has created "uncertainties" in its construction plans which threaten to disrupt the proposed system rollout of authorized Teletrac systems. Here as band, as assumed in Teletrac's request, is not technically necessary or desirable. Mark IV's wideband systems have already been demonstrated to be spectrally efficient through incorporation of very low average power, spectrum spreading from use of short high speed pulses and minimal transmission path length operations. They have already shown their value in meeting vital IVHS/public transportation needs. Freezing all application processing in the 904-912 MHz and 918-926 MHz bands would needlessly preclude implementation of Mark IV systems to meet these needs. In areas where there are no AVM "location" systems authorized, such action would be pointless. In other areas where co-channel "location" systems are authorized, there is no reason to assume that any Mark IV system will cause harmful interference. Mark IV is prepared to cooperate fully with Teletrac and any other co-channel licensees to address any concerns in this regard and to comply fully and promptly with the Commission's decision in this proceeding. The public interest would not be served by freezing the processing of applications for Mark IV systems.

Respectfully submitted,

MARK IV IVHS DIVISION

/s/ George Y. Wheeler
George Y. Wheeler

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1150 Connecticut Avenue, N. W.
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(202) 467-5700

June 4, 1993

Its Counsel

CERTIFICATE OF SERVICE

I, Abbie Weiner, a secretary in the law firm of Koteen & Naftalin, do hereby certify that a copy of the foregoing "Reply Comments of Mark IV IVHS Division" was sent by first class U.S. mail, postage prepaid, on this 4th day of June, 1993, to the offices of the following:

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MARK IV- [redacted] IVHS DIVISION
1200 E. Plano Parkway
Plano, Texas 75074-0278

May 13, 1992

This application is made under Section 90.239 for Automatic Vehicle Monitoring Equipment

System operation

Figure 1 is a block diagram of the automatic vehicle monitoring system. The three main components are the transponder, the antenna and the reader electronics. The transponder (figure 2) is mounted on a vehicle's license plate, under the bumper or at some other point visible to the pavement. The antenna is a

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Necessary and occupied bandwidth:

The necessary bandwidth of the transmission is based on the calculation below, using the definition of Section 2.202(b):

> Bn = 2K/t where K depends on pulse width to rise time ratio. Assuming K = 60 for 20 µS pulses and K = 3 for 1 uS pulses (ie tr = 0.33), then:
> For 20 µS pulses, Bn = 2x60/20 = 6 MHz
> For 1 µS pulses (data), Bn = 2x3/1 = 6 MHz

The occupied bandwidth as defined in section 2.202(a) is based on a spectrum analyzer measurement of the actual signal radiated by the system. Figure 6 is a digitized plot of the signal with a noise floor of -52 dB below the radiated peak power. The plot was digitized in 0.25 MHz increments and the total area of the curve down to this level was calculated. The total energy was then distributed so that 0.5% was above the upper bandwidth limit and 0.5% was below the lower bandwidth limit. These limits, containing 99% of the energy were then deemed the occupied bandwidth.

Nine hundred and ten megaHertz is specified as the operating frequency because peak power of the system occurs at this frequency. As illustrated in Figure 6, the spectrum is not equally spaced on either side of 910 mHz.

Data transmission characteristics

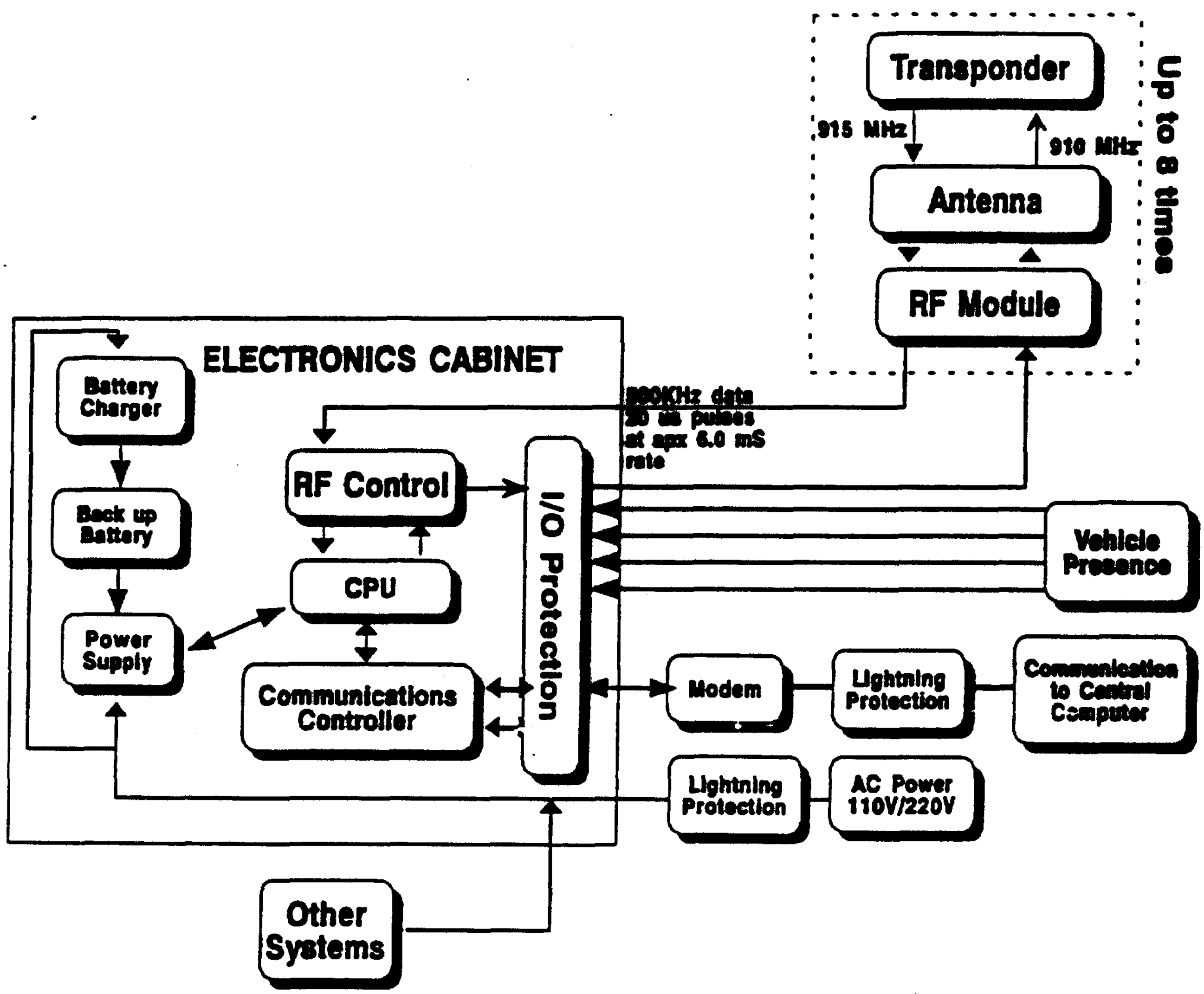
The transmitted reader signal has three components. The first is a 20 µS pulse known as the trigger pulse. This is followed by a 40 bit Manchester encoded data string at 500K bits per second known as the beacon ID. Finally, there is an optional additional data transmission of 128 bits with the same characteristics which represents re-programming data (see figure 5). This transmission is sent on each lane in succession with a total elapsed time of 4.8 mS between successive transmissions on the same lane.

The first two components are continuously transmitted and if a transponder-equipped vehicle appears in the antenna beam, it is activated by the trigger pulse. Its 128 bit data packet is then transmitted to the reader and if a programming cycle is necessary, the reader then transmits the third component. Vehicle location is therefore updated each time a vehicle passes through a reader site.

All modulation is 100% amplitude shift keying with rise times of approximately 0.33 µS and pulse widths of about 1.0 µS during data transmissions and 20 µS during trigger pulses. Bit encoding uses a Manchester format of a zero and a one for half a bit time each, the order being reversed between one and zero bits.

ROADCHECK™

System Block Diagram



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1200 E. Plano Parkway
Plano, Texas 75074-0278

FIGURE 2

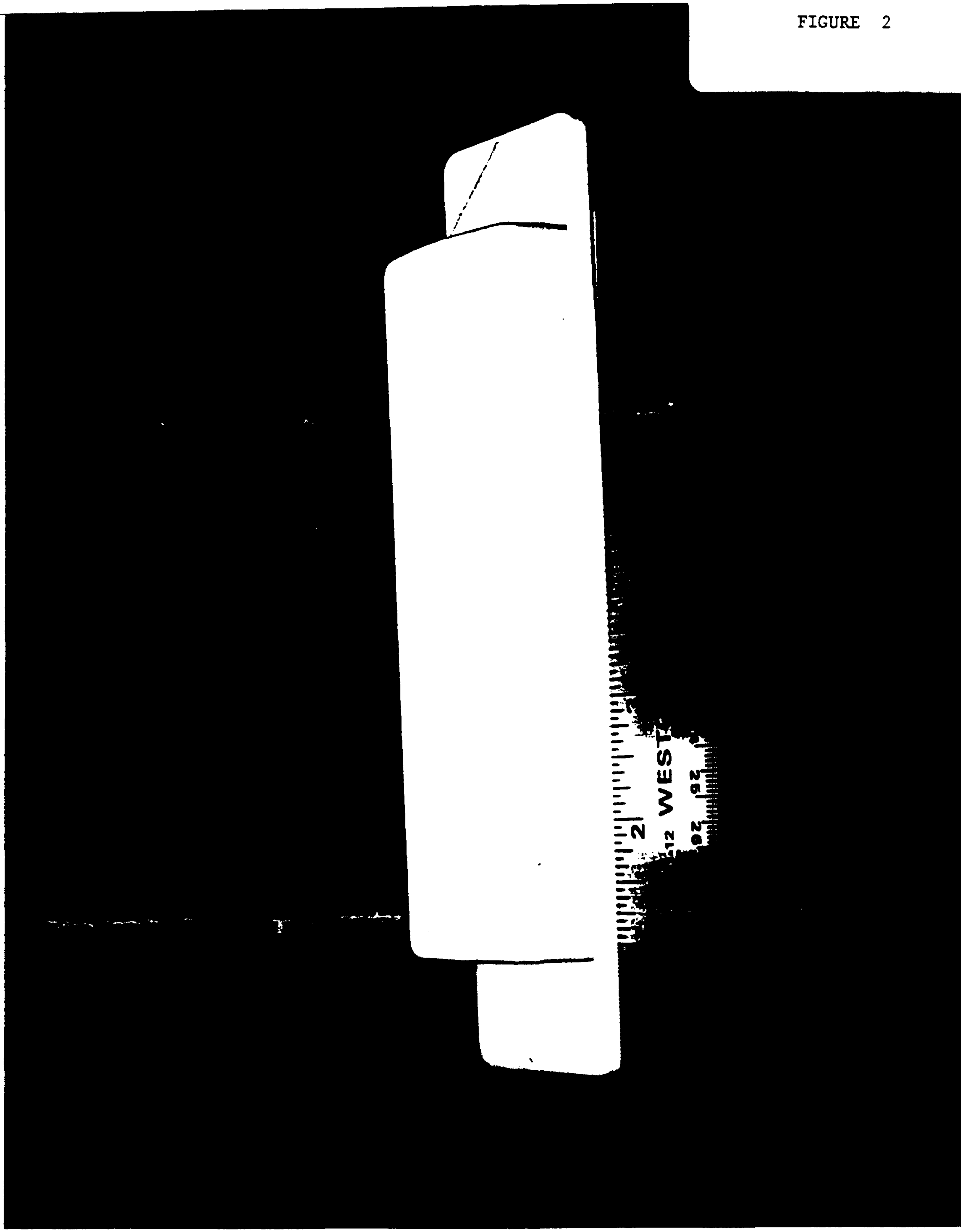
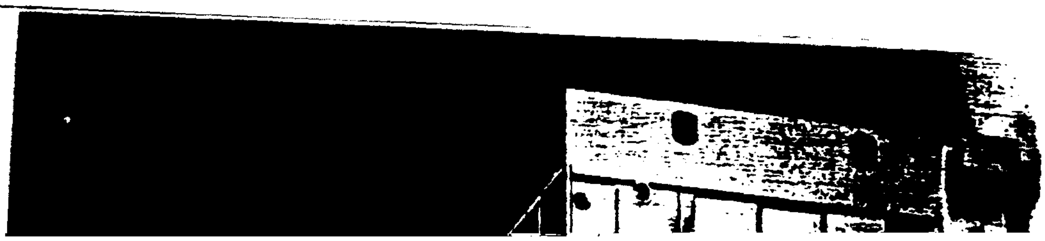


FIGURE 3



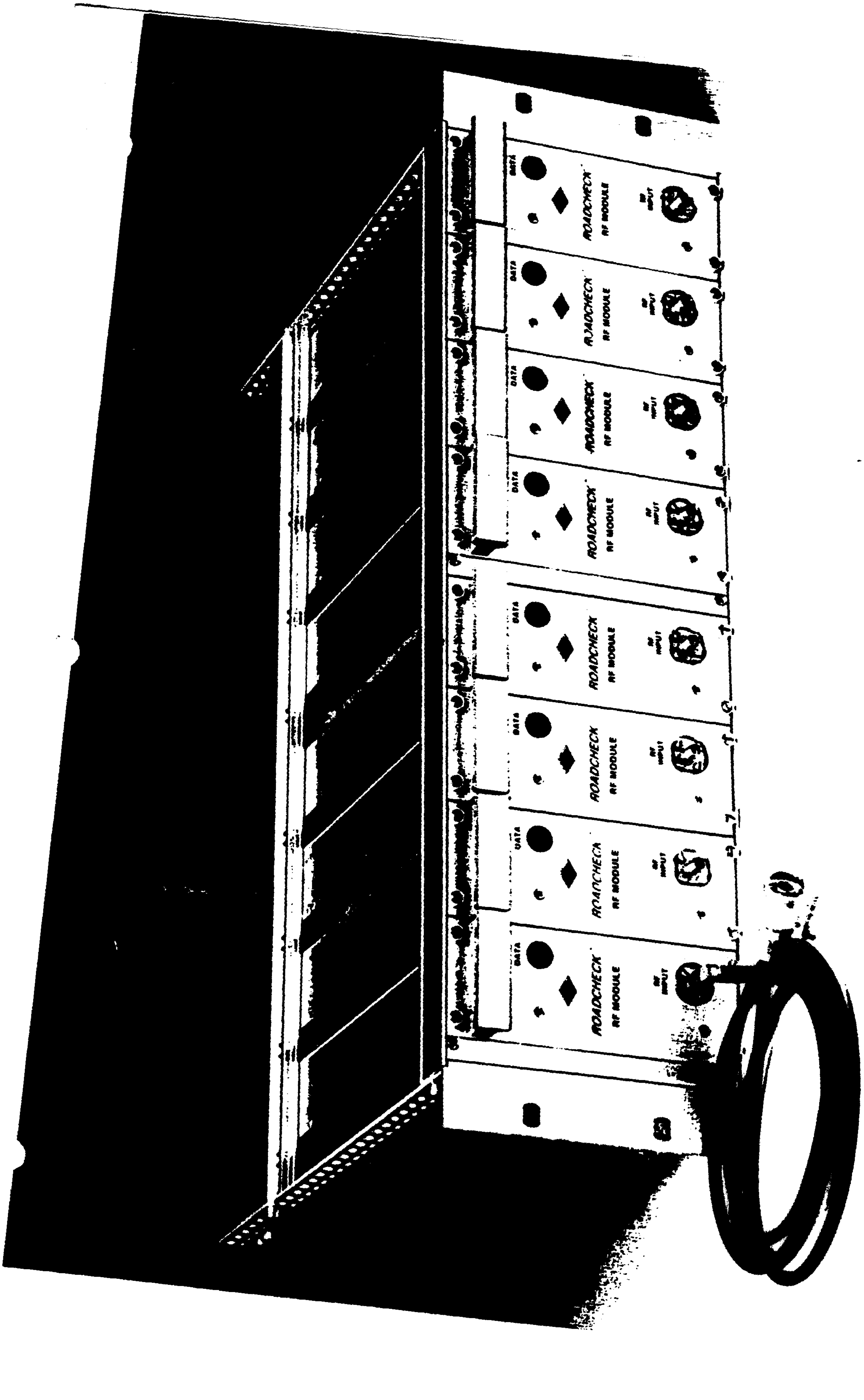
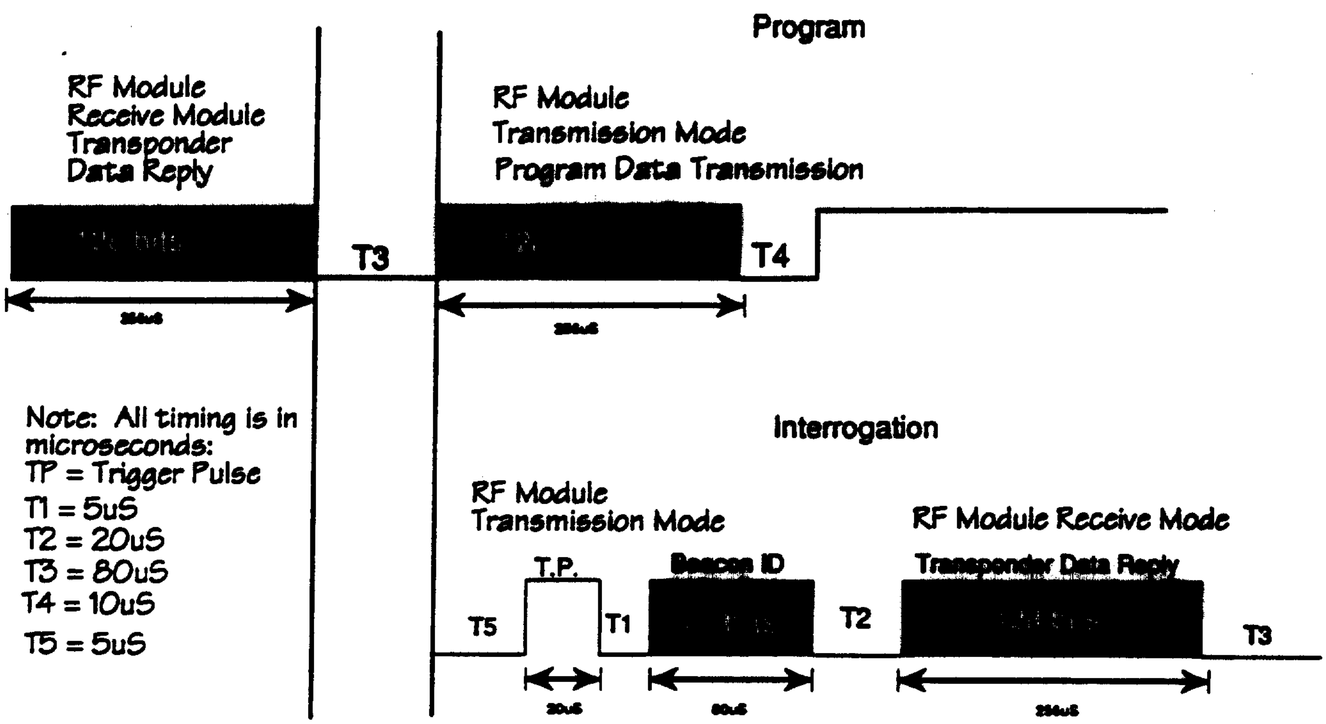


FIGURE 4

Transponder Programming Timing



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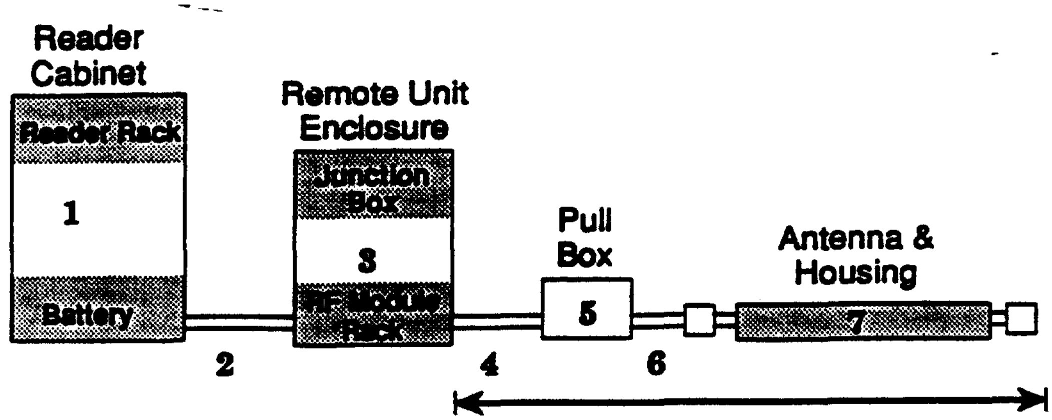
Installation Guidelines



Not to exceed
100 ft with standard cables

Configuration A
All RF Modules in
Remote Unit Enclosure

Note: All conduits must be straight.

Notes:

1. **Electrical enclosure.** Environment-proof. Should conform to local electrical codes. AVI equipment mounts to vertical rails based on standard 19" rack mount. Entrances must include 117 VAC and conduit(s) to other AVI Equipment. Reader and battery require minimum 30" vertical space and 18" depth. Battery is apx. 22" wide

2. **Conduit.** Customer or installer furnished. Environment proof (preferably metal). Maximum length 1000 ft. Minimum internal diameter 1".

3. **Remote unit enclosure.** Environment-proof. Customer or installer furnished. Must be able to accomodate 1 or 2 junction boxes (Vapor p/n 90-3-189). Each junction box holds up to 4 RF modules on a 10" rack.

4. **Conduit.** Customer or installer furnished. May be configured one per lane, or one common conduit capable of holding as many RF cables as are fed to the pull box. Maximum length depends on 6 and 7. Conduit mates to both pull box and junction box or reader cabinet enclosures. Minimum size is 1" and it should be smooth and straight.

5. **Pull box.** Customer or installer furnished. Often mounted in-ground at roadside. Provides a primary or intermediate access for fishing and running cables or antennas into feed conduits and in-pavement structures. Mates to conduits. Lockable cover. Provided with drainage in case of water ingress from conduit(s). ***Note: As shown, NO connections are made in the pull box. Pull box may be combined with remote unit enclosure and junction boxes at certain sites.***

6. **Conduit, in-pavement.** Customer or installer furnished. Must mate with PVC 3/4" conduit part of antenna structure. Must be installed so that there is no accumulation or flow of water into the antenna structure in case of seepage. Metal 1" conduit is prefered for durability. Conduit must be installed smooth and straight to permit insertion of antennas.

7. **Antenna structure.** Far end (1/2" PVC) may be capped or used as water drain depending on site inclination.

ROADCHECK™

Transponder Mounting Guidelines

Vapor's ROADCHECK system is configured to use in-pavement antennas to identify vehicles for the HELP program.

The equipment complies with the HELP specification for Automatic Vehicle Identification (AVI).

Transponders may be mounted in any fashion on the vehicle as long as line of sight is ensured and the lateral offset from the vehicle center is no more than 2 feet (see examples 1 and 3).

Transponders should be mounted on the front of the vehicle so that they are no more than 3'6" from the pavement. If mounted on a license plate, the bottom mounting holes of the transponder should be offset so that part of the transponder hangs below the plate, as shown in example 2.

If this is not possible, the transponder should be mounted as far forward on the vehicle as possible. Transponders should be mounted so that the long axis is across the lane with the Vapor logo right side up.

Figure 6 - TRANSMITTER POWER SPECTRUM